SNI

Standar Nasional Indonesia

SNI 04-6507.2-2002

"Hak Cipta Badan Standardisasi Nasional, copy standar ini dibuat untuk penayangan di website Akses SNI dan tidak untuk dikomersilkan"

CIRCUIT-BREAKERS FOR OVERCURRENT PROTECTION FOR HOUSEHOLD AND SIMILAR INSTALLATIONS – Part 2: Circuit-breakers for a.c. and d.c. operation

ICS 27.180

Badan Standardisasi Nasional BSN

“Hak Cipta Badan Standardisasi Nasional, copy standar ini dibuat untuk penayangan di website Akses SNI dan tidak untuk dikomersilkan"

Prakata

SNI rnengenai Pemutus sirkit untuk proteksi arus lebih pada instalasi rumah tangga dan sejenisnya – Bagian 2: Pemutus sirkit untuk operasi arus bolak-balik dan arus searah, diadopsi dari standar International Electrotechnical Commission (IEC) Publikasi 60898-2 (2000-06).

Standar ini dirurnuskan oleh Panitia Teknik Pemanfaat/Peranti Listrik (PTPM) dan telah dibahas dalam rapat konsensus pada tanggal 9 – 10 Oktobcr 2002.

"Hak Cipta Badan Standardisasi Nasional, copy standar ini dibuat untuk penayangan di website Akses SNI dan tidak untuk dikomersilkan"

CONTENTS

Page

FOREWORD iii

Clause

1 General 1

2 Normative references 1

3 Definitions 1

4 Classification 2

5 Characteristics of circuit-breakers 2

6 Marking and other product information 4

7 Standard conditions for operation in service 5

8 Requirements for construction and operation 5

9 Tests 6

Annexes 13

Annex C 14

Figure 7b – Calibration of the test circuit in case of direct currents 11

Figure 17 – Examples of connections of the circuit-breakers in different d.c. systems 12

Table 1 – Preferred values of rated voltage 3

Table 2 – Range of instantaneous tripping 3

Table 6 – Time-current operating characteristics 5

Table C.1 – Test sequences 14

Table C.2 – Number of samples for full test procedure 15

"Hak Cipta Badan Standardisasi Nasional, copy standar ini dibuat untuk penayangan di website Akses SNI dan tidak untuk dikomersilkan"

"Hak Cipta Badan Standardisasi Nasional, copy standar ini dibuat untuk penayangan di website Akses SNI dan tidak untuk dikomersilkan"

INTERNATIONAL ELECTROTECHNICAL COMMISSION

CIRCUIT-BREAKERS FOR OVERCURRENT PROTECTION FOR HOUSEHOLD AND SIMILAR INSTALLATIONS -

Part 2: Circuit-breakers for a.c. and d.c. operation

FOREWORD

1) The IEC (International Electrotechnical Commission) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of the IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, the IEC publishes International Standards. Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. The IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.

2) The formal decisions or agreements of the IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested National Committees.

3) The documents produced have the form of recommendations for international use and are published in the form of standards, technical specifications, technical reports or guides and they are accepted by the National Committees in that sense.

4) In order to promote international unification, IEC National Committees undertake to apply IEC International Standards transparently to the maximum extent possible in their national and regional standards. Any divergence between the IEC Standard and the corresponding national or regional standard shall be clearly indicated in the latter.

5) The IEC provides no marking procedure to indicate its approval and cannot be rendered responsible for any equipment declared to be in conformity with one of its standards.

6) Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. The IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 60898-2 has been prepared by subcommittee 23E: Circuit-breakers and similar equipment for household use, of IEC technical committee 23: Electrical accessories.

The text of this standard is based on the following documents:

FDIS	Report on voting
23E/412/FDIS	23E/424/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 3.

This Part 2 is to be used in conjunction with IEC 60898-1.

Where a particular subclause of Part 1 is not mentioned in this Part 2, that subclause applies as far as is reasonable. Where this Part 2 states "addition", "modification" or "replacement", the corresponding requirement, test specification or explanatory material in Part 1 should be adapted accordingly.

In this publication, the following print types are used:

– requirements proper: in roman type;

– test *specifications: in italic type;*

– notes: in smaller roman type.

The committee has decided that the contents of this publication will remain unchanged until 2005. At this date, the publication will be

- reconfirmed;
- withdrawn;
- replaced by a revised edition, or
- amended.

"Hak Cipta Badan Standardisasi Nasional, copy standar ini dibuat untuk penayangan di website Akses SNI dan tidak untuk dikomersilkan"

CIRCUIT-BREAKERS FOR OVERCURRENT PROTECTION FOR HOUSEHOLD AND SIMILAR INSTALLATIONS – Part 2: Circuit-breakers for a.c. and d.c. operation

1 General

This clause of Part 1 is applicable except as follows:

1.1 Scope

Addition at *the end of the first paragraph:*

This standard gives additional requirements for single- and two-pole circuit-breakers suitable for operation with direct current, having a rated d.c. voltage not exceeding 220 V for single-pole and 440 V for two-pole circuit-breakers, a rated current not exceeding 125 A and a rated d.c. short-circuit capacity not exceeding 10 000 A.

NOTE This standard applies to circuit-breakers able to make and break both a.c. current and d.c. ci rrent.

Delete the last *two paragraphs.*

1.2 Object

Delete *item 6.*

2 Normative references

Clause 2 of Part 1 applies with the following modification:

Delete IEC 61009-1:1991, *IEC 61009-2-1:1991 and IEC 61009-2-2:1991.*

3 Definitions

Clause 3 of Part 1 applies with the following modification: .

Addition:

3.5.20

time constant

the rise time $T = LIR$ (ms) of a prospective direct current to reach a value of 0,63 times the maximum peak current

4 Classification

Clause 4 of Part 1 applies with the following modifications:

4.1 According to the number of poles

"Hak Cipta Badan Standardisasi Nasional, copy standar ini dibuat untuk penayangan di website Akses SNI dan tidak untuk dikomersilkan"

Replacement:

– single-pole circuit-breakers;

– two-pole circuit-breakers with two protected poles.

4.2 According to the instantaneous tripping current (see 3.5.17)

Delete D-Type.

Addition

4.3 According to the time constant

– Circuit-breakers suitable for d.c. circuits with a time constant of T ≤ 4 ms.

– Circuit-breakers suitable for d.c. circuits with a time constant of T ≤ 15 ms.

NOTE It is assumed that short-circuit currents of 1 500 A are not exceeded in installations in which, due to the loads connected, time constants in normal service up to 15 ms can occur. Where higher short-circuit currents may occur, the time constant of T = 4 ms is considered sufficient.

5 Characteristics of circuit-breakers

Clause 5 applies with the following modification:

5.3.1 Preferred values of rated voltage

Replacement:

The preferred values of rated voltages are given in table 1.

Examples of connections of circuit-breakers in d.c. systems are given in figure 17.

Table 1 – Preferred values of rated voltage

"Hak Cipta Badan Standardisasi Nasional, copy standar ini dibuat untuk penayangan di website Akses SNI dan tidak untuk dikomersilkan"

Circuit-breakers	AC		DC [b]	
	AC circuit supplying the circuit-breaker	Rated voltage a.c.	Rated voltage d.c.	DC wiring examples
Single-pole	Single-phase (phase to neutral)	230 V	220 V	Figure 17a
	Single-phase (phase to earthed middle conductor, or phase to neutral)	120 V	125 V	
	Single-phase (phase to neutral) or three-phase (3 single-pole circuit-breakers) (3-wire or 4-wire)	230/400 V	220 V	
Two-pole	Single-phase (phase-to-phase)	400 V	220/440 V	Figures 17b, 17c, 17d
	Single phase (phase-to-phase, 3-wire)	120/240 V [a]	125/250 V [a]	

Applicable for d.c. voltages:

[a] Also for single-pole circuit-breakers to be used in pairs at 250 V d.c. (respectively 240 V a.c.) and individually at 125 V d.c. (respectively 120 V a.c.).

[b] The rated voltage per pole shall not exceed 220 V d.c.

Applicable for a.c. voltages:

NOTE 1 In IEC 60038 the network voltage value of 230/400 V has been standardized. This value should progressively supersede the values of 220/380 V and 240/415 V.

NOTE 2 Wherever in this standard there is a reference to 230 V or 400 V, it may be read as 220 V or 240 V, and 380 V or 415 V respectively.

NOTE 3 Circuit-breakers complying with the requirements of this standard may be used in IT systems.

The manufacturer shall declare in his literature the minimum voltage for which the circuit-breaker is designed.

Relevant tests are under consideration.

5.3.5 Standard ranges of instantaneous tripping

Replacement:

Table 2 – Ranges of instantaneous tripping

Type	Ranges for a.c.	Ranges for d.c.
B	Above 3 I_n up to and including 5 I_n	Above 4 I_n up to and including 7 I_n
C	Above 5 I_n up to and including 10 I_n	Above 7 I_n up to and including 15 I_n

6 Marking and other product information

Clause 6 of Part 1 applies with the following modifications:

Replacement:

c) rated a.c. voltage with the symbol — and rated d.c. voltage with the symbol ------

d) replace (B, C or D) *by* (B *or C).*

"Hak Cipta Badan Standardisasi Nasional, copy standar ini dibuat untuk penayangan di website Akses SNI dan tidak untuk dikomersilkan"

f) rated short-circuit capacity for a.c. and d.c. in amperes in one rectangle, without the symbol A, if valid for both a.c. and,.d.c. (see example 1 below). If the rated short-circuit capacity is different for a.c. and d.c. this shall be indicated in two adjacent rectangles, without the symbol A, with the symbol ------ near the rectangle containing the a.c value and with the symbol ~ near the rectangle containing the d.c. value (see example 2 below).

Addition:

j) time constant T15 within a rectangle, if applicable, associated with the marking for the short-circuit capacity at the time constant of 15 ms (see example 3 below).

Replacement of the first paragraph following j):

If, for small devices, the space available does not allow all the above data to be marked, at least the information under c) and d) shall be marked and visible when the circuit-breaker is installed.

The information under a), b), e), f), g), h), i) and j) may be marked on the side or on the back of the device and be visible only before the device is installed.

Alternatively, the information under ,g) may be on the inside of any cover which has to be removed in order to connect the supply wires. Any remaining information not marked shall be given in the manufacturer's literature.

EXAMPLE 1 6 000

EXAMPLE 2 10 000 ~

6 000 ——

EXAMPLE 3 1 500 T15

The terminals shall be marked with + or — if necessary. Additionally, arrows indicating the direction of the current are allowed.

7 Standard conditions for operation in service

Clause 7 of Part 1 applies.

8 Requirements for construction and operation

Clause 8 of Part 1 applies with the following modifications:

8.6.1 Standard time-current zone

"Hak Cipta Badan Standardisasi Nasional, copy standar ini dibuat untuk penayangan di website Akses SNI dan tidak untuk dikomersilkan"

Replacement:

Table 6 – Time-current operatinq characteristics

Test	Type	Test current a.c.	Test current d.c.	Initial condition	Limits of tripping or non-tripping time	Result to be obtained	Remarks
a	B, C	1,13 I_n		Cold*	$t \geq 1$ h ($I_n \leq 63$ A) $t \geq 2$ h ($I_n > 63$ A)	No tripping	
b	B, C	1,45 I_n		Immediately following test a	$t < 1$ h ($I_n \leq 63$ A) $t < 2$ h ($I_n > 63$ A)	Tripping	Current steadily increased within 5 s
c	B, C	2,55 I_n		Cold*	1 s < t < 60 s ($I_n \leq 32$ A) 1 s < t < 120 s ($I_n > 32$ A)	Tripping	
d	B C	3 I_n 5 I_n	4 I_n 7 I_n	Cold*	0,1 < t < 45 s ($I_n \leq 32$ A) 0,1 < t < 90 s ($I_n > 32$ A) 0,1 < t < 15 s ($I_n \leq 32$ A) 0,1 < t < 30 s ($I_n > 32$ A)	Tripping	Current established by closing an auxiliary switch
e	B C	5 I_n 10 I_n	7 I_n 15 I_n	Cold*	t < 0,1 s	Tripping	Current established by closing an auxiliary switch

* The term "cold" means without previous loading, at the reference calibration temperature.

8.8 Performance at short-circuit currents

Replacement of the third paragraph:

It is required that circuit-breakers be able to make and to break any value of current up to and including the value corresponding to the rated short-circuit capacity at rated frequency, at a power-frequency recovery voltage equal to 105 % (±5 %) of the rated operational voltage and at any power factor not less or any time constant not greater than the appropriate limit of the range stated in 9.12.5; it is also required that the corresponding values of I^2t lie below the I^2t characteristic (see 3.5.13).

9 Tests

Clause 9 of Part 1 applies with the following modifications:

9.1 Type tests and test sequences

Replacement of the first paragraph of 9.1.2:

The test sequences and the number of samples to be submitted are stated in annex C of this standard.

"Hak Cipta Badan Standardisasi Nasional, copy standar ini dibuat untuk penayangan di website Akses SNI dan tidak untuk dikomersilkan"

9.10.2 Test of instantaneous tripping

Replacement:

9.10.2.1 For circuit-breakers of the B-type

An alternating current equal to 3 I_n is passed through all poles, starting from cold. Th opening time shall be not less than 0,1 s and not more than:

- *45 s for rated currents up to and including 32 A;*
- *90 s for rated currents above 32 A.*

An alternating current equal to 5 I_n is then passed through all poles, starting from cold. The circuit-breaker shall trip in a time less than 0,1 s.

A direct current equal to 4 I_n is passed through all poles, starting from cold. The opening time shall be not less than 0,1 s and not more than:

- *45 s for rated currents up to and including 32 A;*
- *90 s for rated currents above 32 A.*

A direct current equal to 7 I_n is then passed through all poles, starting from cold. The circuit-breaker shall trip in a time less than 0,1 s.

9.10.2.2 For circuit-breakers of the C-type

An alternating current equal to 5 I_n is passed through all poles, starting from cold. The opening time shall be not less than 0,1 s and not more than:

- *15 s for rated currents up to and including 32 A;*
- *30 s for rated currents above 32 A.*

An alternating current equal to 10 I_n is then passed through all poles, starting from cold. The circuit-breaker shall trip in a time less than 0,1 s.

A direct current equal to 7 I_n is passed through all poles, starting from cold. The opening time shall be not less than 0,1 s and not more than:

- *15 s for rated currents up to and including 32 A;*
- *30 s for rated currents above 32 A.*

A direct current equal to 15 I_n is then passed through all poles, starting from cold. The circuit-breaker shall trip in a time less than 0,1 s.

9.11 Test of mechanical and electrical endurance

"Hak Cipta Badan Standardisasi Nasional, copy standar ini dibuat untuk penayangan di website Akses SNI dan tidak untuk dikomersilkan"

9.11.1 General test conditions

Replacement of the fourth paragraph:
The alternating current shall have a substantially sine-wave form and the power factor shall be between 0,85 and 0,9.
The direct current shall have a ripple of ω≤5 % and a time constant of T = 4 ms (with a tolerance of 0_{-10} %) or, for circuit-breakers marked with T15, a time constant of T = 15 ms (with a tolerance of 0_{-10} %).

9.11.2 Test procedure

Replacement of the first paragraph:
One set of circuit-breakers is submitted to 4 000 operating cycles at alternating current, and another set to 1 000 operating cycles at direct current, both at their rated current.

9.12.3 Tolerances and test quantities

Addition:

– ripple ≤5 %
- time constant 0_{-10} %

9.12.5 Power factor of the test circuits

Replacement:

9.12.5 Power factor and time constant of the test circuits

Addition:
For d.c. test currents up to and including 1 500 A, one of the following time constants shall be used:
T = L / R = 4 ms for devices not marked T15
T=L/ R= 15 ms for devices marked T15.

For d.c. tests currents above 1 500 A and less than or equal to 10 000 A, the tests for all samples are made at the time constant of T = 4 ms.
NOTE It is assumed that short-circuit currents of 1 500 A are not exceeded in installations in which, due to the loads connected, time constants in normal service up to 15 ms can occur. Where higher short-circuit currents may occur, the time constant of *T* = 4 ms is considered sufficient.

9.12.8 Interpretation of records

Modification:

"Hak Cipta Badan Standardisasi Nasional, copy standar ini dibuat untuk penayangan di website Akses SNI dan tidak untuk dikomersilkan"

9.12.8.1 Interpretation of records in cake of a.c. voltage

The existing text of 9.12.8 applies.

Addition:

9.12.8.2 Interpretation of records in case of d.c. voltage

a) Determination of the applied voltage and the recovery voltage.

The applied voltage and the recovery voltage are determined from the record taken during the break test.

The voltage on the supply side shall be measured after are extinction and after high frequency phenomena have subsided.

b) Determination of the prospective short-circuit current.

NOTE The value of the prospective current is taken as being equal to the maximum value A_2 as determined from the calibration curve because circuit-breakers according to this standard break the current before it has reached its maximum value.

The maximum value of the prospective current is indicated as A_2 in figure 7b.

9.12.11.2 Tests at reduced short-circuit currents

Replacement:

9.12.11.2 Tests at reduced short-circuit currents and at small direct currents

Modification:

9.12.11.2.1 Tests at reduced a.c. short-circuit currents

The existing text of 9.12.11.2 applies.

Addition:

9.12.11.2.2 Tests at reduced d.c. short-circuit currents

At direct currents the test circuit is adjusted so as to obtain a current of 500 A or 10 x I_n whichever is the higher, at a time constant corresponding to the assigned time constant.

Each of the protected poles of the circuit-breaker is subjected separately to a test in a circuit, of which the connections are shown in figure 3.

The circuit-breaker is caused to open automatically three times, the circuit being closed once by the auxiliary switch A and twice by the circuit-breaker itself.

The sequence of operations shall be:

$$O - t - CO - t - CO$$

"Hak Cipta Badan Standardisasi Nasional, copy standar ini dibuat untuk penayangan di website Akses SNI dan tidak untuk dikomersilkan"

After arc extinction, the recovery voltage shall be maintained for a duration not less than 0,1 s.

9.12.11.2.3 *Test at* small direct currents up to and including 150 A

The circuit-breaker shall be closed three times on to each of the test currents listed below; during the tests the operating means is actuated as in normal use. If the circuit-breaker does not trip, it shall be switched off manually.

Test currents: 1 A, 2 A, 4 A, 8 A, 16 A, 32 A, 63 A, 150 A

The time between each operating cycle CO shall be at least 10 s, the closing time shall not be longer than 2 s. The time between the various test currents shall be at least 2 min.
The time of the arc extinction during the test shall not exceed 1 s.

9.12.11.3 *Test at* 1 500 A

Replacement of the first paragraph:

For circuit-breakers having rated short-circuit capacity of 1 500 A, the test circuit is calibrated according to 9.12.7.1 and 9.12.7.2, to obtain a current of 1 500 A at a power factor corresponding to this current according to table 14.

For direct current the time constant is calibrated corresponding to the assigned time constant.
Replacement of the second paragraph:

For circuit-breakers having rated short-circuit capacity exceeding 1 500 A, the test circuit is calibrated according to 9.12.7.1 and 9.12.7.3, at a power factor corresponding to 1 500 A, according to table 14.

For direct current the time constant is calibrated corresponding to the assigned time constant.
Replace the eleventh paragraph:

The sequence of operations shall be as specified in 9.12.11.2.1 and 9.12.11.2.2.
For single-pole circuit-breakers of rated voltage 230/400 V the operations for a.c. are as follows:

Subsequent to the six O operations only two CO operations are performed. In addition, these circuit-breakers are then tested by performing simultaneously one 0 operation, with one circuit-breaker being inserted in each phase of the test circuit for three-pole circuit-breakers

"Hak Cipta Badan Standardisasi Nasional, copy standar ini dibuat untuk penayangan di website Akses SNI dan tidak untuk dikomersilkan"

(see figure 5). For this test the auxiliary switch establishing the short-circuit is not synchronized
For the tests at d.c.

– *single-pole circuit-breakers of rated voltage 220 V are tested in a circuit according to figure 3;*
– *two-pole circuit-breakers of rated voltage 440 V are tested in a circuit according to figure 4b.*

9.12.11.4.2 Test at service short-circuit capacity (Ics) *Replacement of the first paragraph of a):*

a) The test circuit is calibrated according to 9.12.7.1 and 9.12.7.3, on a.c. with a power factor according to table 14, or on d.c. with a time constant according to 9.12.5.

Addition:

e) In the case of direct current, the test sequence for single- and two-pole circuit-breakers is:

O – t – CO – t – CO

Three operations are made, the circuit being closed once by the auxiliary switch A and twice by the circuit-breaker.
Single-pole circuit-breakers of rated voltage 220 V are tested in a circuit according to figure 3. Two-pole circuit-breakers of rated voltage 440 V are tested in a circuit according to figure 4b.

9.12.11.4.3 Test at rated short-circuit capacity (Icn)

Replacement of the first paragraph:

a) The test circuit is calibrated according to 9.12.7.1 and 9.12.7.2, on a.c. with a power factor according to table 14, on d.c. with a time constant according to 9.12.5.

Addition:

c) in the case of direct current, the test sequence-for single- and two-pole circuit-breakers is:
O – t – CO
Two operations are made, the circuit being closed once by the auxiliary switch A and once by the circuit-breaker.
Single-pole circuit-breakers of rated voltage 220 V are tested in a circuit according to figure 3.

Two-pole circuit-breakers of rated voltage 440 V are tested in a circuit according to figure 4b.

9.12.12 *Verification of the circuit-breaker after short-circuit tests*

Addition at the end of 9.12.12.2:

"Hak Cipta Badan Standardisasi Nasional, copy standar ini dibuat untuk penayangan di website Akses SNI dan tidak untuk dikomersilkan"

The test of 9.12.11.2.3 is repeated but the test currents 63 A and 150 A are omitted.

Figures

The figures of Part 1 apply *with the* following modifications:

Renumber figure 7 as figure 7a.

Addition:

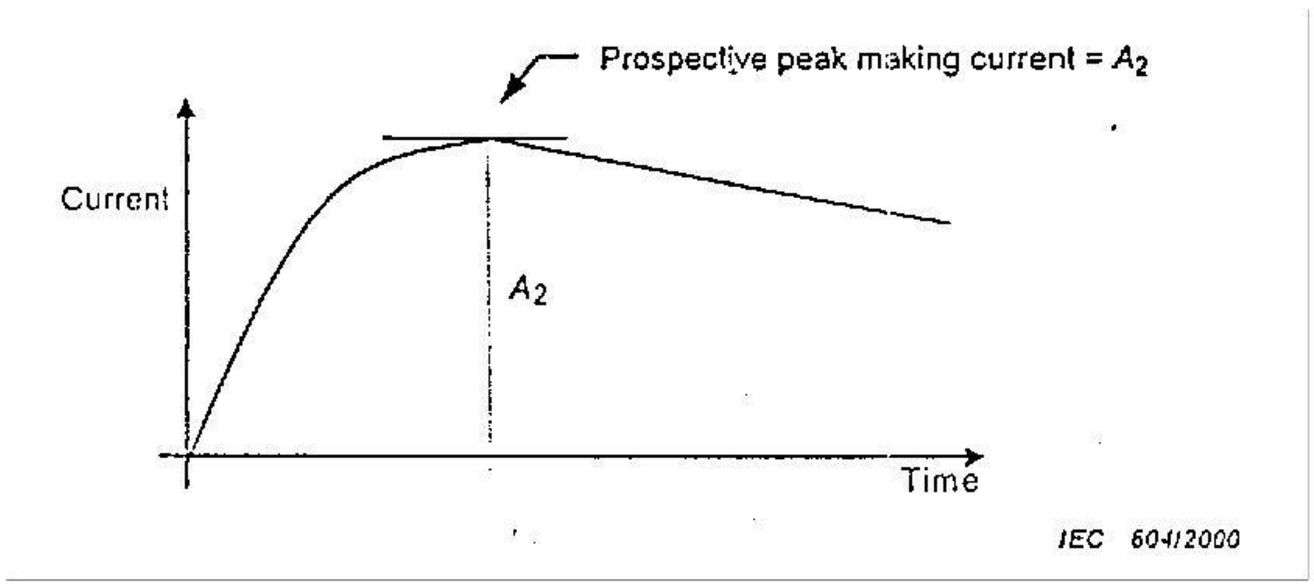
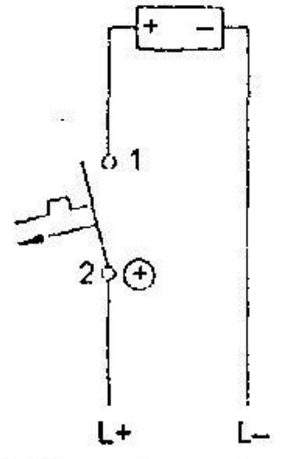
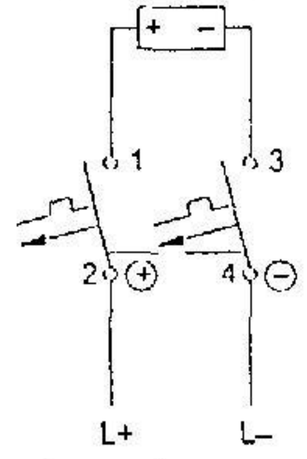
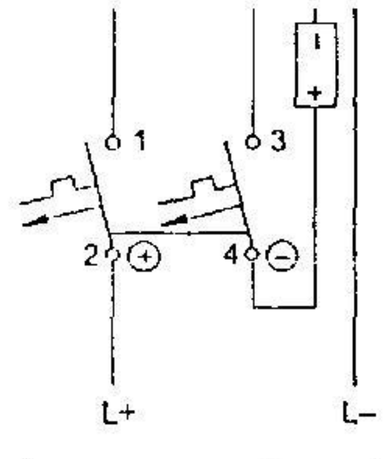
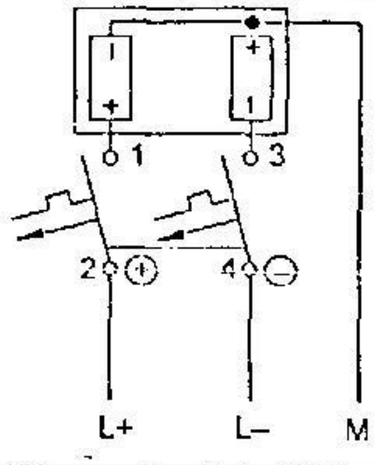


Figure 7b — Calibration of the test circuit in case of direct currents

"Hak Cipta Badan Standardisasi Nasional, copy standar ini dibuat untuk penayangan di website Akses SNI dan tidak untuk dikomersilkan"

Addition:

	a			b			c			d		
Circuit-breaker rated voltage	220 V	125 V	125/250 V	220/440 V	250 V	125/250 V	220/440 V	250 V	125/250 V	220/440 V	250 V	125/250 V
Maximum voltage between the conductors	220 V	125 V	125 V	440 V	250 V	250 V	440 V	250 V	250 V	440 V	250 V	250 V
Maximum voltage between conductor and earth	220 V	125 V	125 V	220 V	125 V	125 V	440 V [a]	250 V [a]	250 V [a]	220 V	125 V	125 V
Circuit breaker	Single-pole			Two-pole			Two-pole			Two-pole		
Circuit												

[a] Negative pole earthed.

"Hak Cipta Badan Standardisasi Nasional, copy standar ini dibuat untuk penayangan di website Akses SNI dan tidak untuk dikomersilkan"

Annexes

The annexes of Part 1 are applicable, except as follows:

"Hak Cipta Badan Standardisasi Nasional, copy standar ini dibuat untuk penayangan di website Akses SNI dan tidak untuk dikomersilkan"

Annex C

Annex C of Part 1 applies with the following modifications:

Replacement:

Table C.1 — Test sequences

Test sequence	Clause or subclause	Test (or inspection)		
A	6			Marking
	8.1.1			General
	8.1.2			Mechanism
	9.3			Indelibility of marking
	8.1.3			Clearances and creepage distances (external parts only)
	8.1.6			Non-interchangeability
	9.4			Reliability of screws, current-carrying parts and connections
	9.5			Reliability of screw-type terminals for external conductors
	9.6			Protection against electric shock
	8.1.3			Clearances and creepage distances (internal parts only)
	9.14			Resistance to heat
	9.15			Resistance to abnormal heat and to fire
	9.16			Resistance to rusting
B	9.7			Dielectric properties
	9.8			Temperature rise
	9.9			28-day test
		Test performed at		
C	9.11	a.c.	d.c.	Mechanical and electrical endurance
	9.12.11.2	a.c.	d.c.	Performance at reduced short-circuit currents and at reduced direct currents
	9.12.12			Verification of circuit-breaker after short-circuit tests
D_0	9.10	a.c.	d.c.	Tripping characteristic
D ----------	----------	------	------	----------
D_1	9.13			Resistance to mechanical shock and impact
	9.12.11.3	a.c.	d.c.	Short-circuit performance at 1 500 A
	9.12.12			Verification of circuit-breaker after short-circuit tests
E_1	9.12.11.4.2	a.c.	d.c.	Service short-circuit capacity (I_{cs})
	9.12.12			Verification of circuit-breaker after short-circuit tests
E ----------	----------	------	------	----------
E_2	9.12.11.4.3	a.c.	d.c.	Performance at rated short-circuit capacity (I_{cn})
	9.12.12			Verification of circuit-breaker after short-circuit tests

NOTE With the agreement of the manufacturer the same samples may be used for more than one sequence.

"Hak Cipta Badan Standardisasi Nasional, copy standar ini dibuat untuk penayangan di website Akses SNI dan tidak untuk dikomersilkan"

Replacement:

Table C.2 — Number of samples for full test procedure

Test sequence	Number of samples		Minimum number of samples which shall pass the tests [a, b]		Number of samples for repeated tests [c]	
	AC ~	DC ⎓	AC ~	DC ⎓	AC ~	DC ⎓
A	1		1			
B	3		2		3	
C	3	3	2 [e]	2 [e]	3	3
D	3	3	2 [e]	2 [e]	3	3
E1	3 + 3 [d]	3	2 [e] + 2 [d, e]	2 [e]	3 + 3 [d]	3
E2	3 + 4 [d]	3	2 [e] + 3 [d, e]	2 [e]	3 + 4 [d]	3

[a] In lolal, a maximum of two test sequences may be repeated.

[b] It is assumed that a sample which has not passed a test has not met the requirements due to workmanship or assembly defects which are not representative of the design.

[c] In the case of repeated tests, all results shall be acceplable.

[d] Supplementary samples in the case of single-pole circuit-breakers of rated vollage 230/400 V.

[e] All samples shall meet the test requirements of 9.12.10, 9.12.11.2, 9.12.11.3 and 9.12.11.4 as appropriate.

"Hak Cipta Badan Standardisasi Nasional, copy standar ini dibuat untuk penayangan di website Akses SNI dan tidak untuk dikomersilkan"